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ABSTRACT

The course of study represents the first of six modules in advanced crop and soil science and introduces the agriculture student to the topic of soil management. Upon completing the two day lesson, the student will be able to define "soil", list the soil forming agencies, define and use soil terminology, and discuss soil formation and what makes up the soil complex. Information and directions necessary to make soil profiles are included for the instructor's use. The course outline suggests teaching procedures, behavioral objectives, teaching aids and references, problems, a summary, and evaluation. Following the lesson plans, pages are coded for use as handouts and overhead transparencies. A materials source list for the complete soil module is included. (MW)

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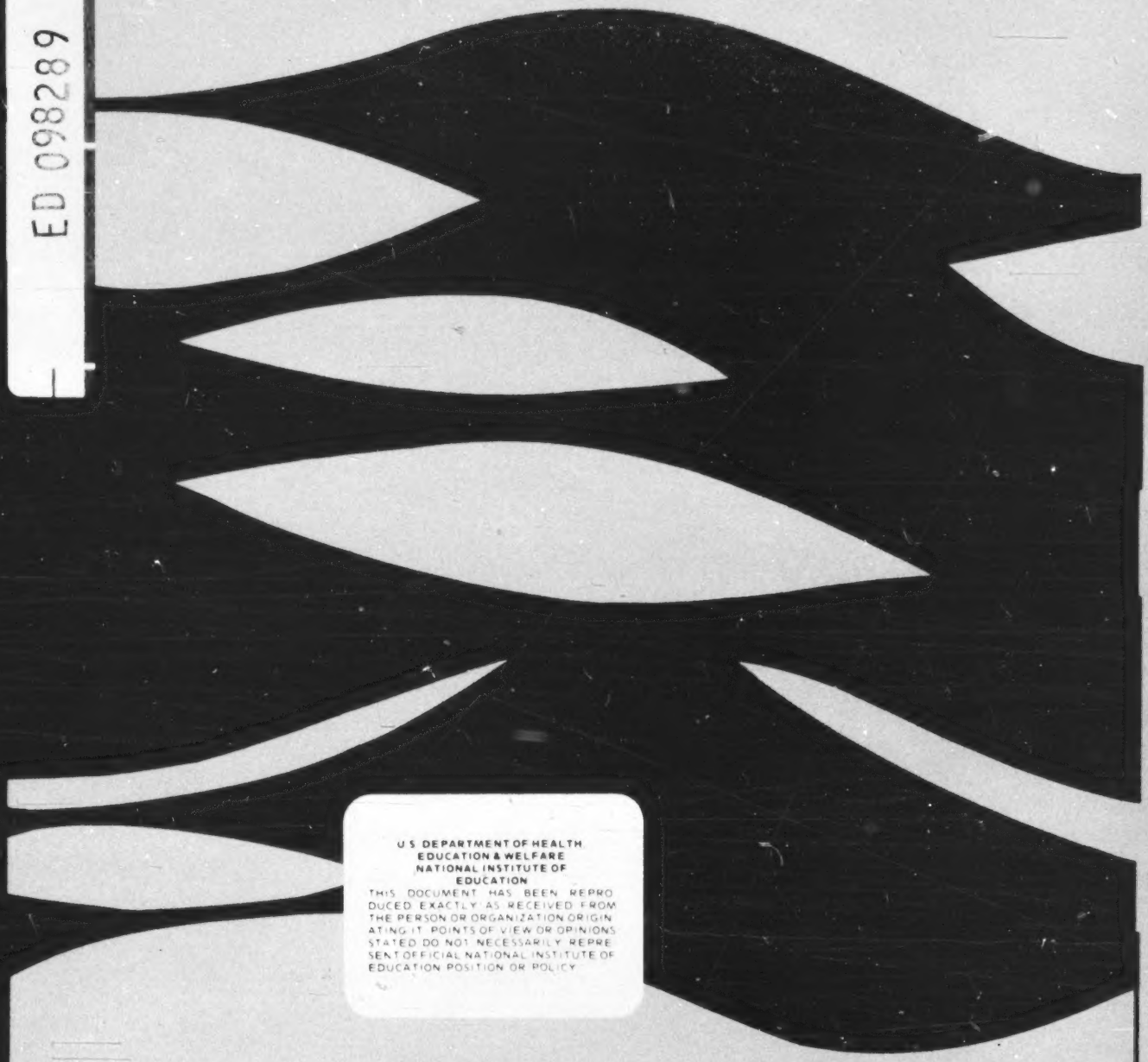

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WHAT IS SOIL?

Agricultural Education, College of Education
Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

In Cooperation With

Agricultural Education Service, Division of Vocational Education
State Department of Education, Richmond, VA 23216
Prepared by Larry E. Miller

Publication AP-9
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ADVANCED CROP AND SOIL SCIENCE
A COURSE OF STUDY

Prepared by
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A Virginia Polytechnic Institute and State University
Extension Division
Education Field Service Publication

How to Use This Book

This course of study is divided into six modules, as enumerated in the index. Each lesson plan contains the title of the:

course,
module,
a suggested time allotment,
a suggested teaching procedure,
objectives of the lesson,
example introduction techniques,
suggested references and teaching aids,
problems,
summary,
and example evaluatory statements.

Space is provided for individual evaluation.

Modules are lettered consecutively, with numbered pages within each module. A small letter following the number denotes its position within the numbered sequence. Following the lesson plans, pages are also denoted with the letter "H", recommended as a handout; and the letter "T", recommended as an overhead transparency.

Some instructors may find it of greater convenience to assemble a "slide-bank" of these teaching aids.

Materials Source List
(Soil Module Only)

SELECTED REFERENCES:

Books:

*Profitable Soil Management, Knuti, Korpi and Hide, Prentice-Hall, Englewood Cliffs, New Jersey 07632, 1969, $8.36.
*Introductory Soils, Berger, K.C., 1965, Macmillan Company, 866 3rd. Avenue, New York, N.Y. 10022, $8.50.
*Soils: An Introduction to Soils and Plant Growth, 2nd Ed., Donahue, Prentice-Hall, 1964, $9.75.
*Approved Practices in Soil Conservation, Foster, Interstate, 1964, $3.80.
*Our Soils and Their Management, Donahue, Interstate, $5.00.
**Farm Soils, Worthen and Aldrich, Wiley & Sons.
**Fundamentals of Soil Science, Millar, Turk.
**The Nature and Properties of Soils, Buckman and Brady, Macmillan, 1969, $10.95.
**Soils and Soil Fertility, Thompson, McGraw-Hill.
**Soil Fertility and Fertilizers, Tisdale and Nelson, Macmillan, 2nd Ed. 1966, $12.95.
**Soil Use and Improvement, Stallings, J.H., Prentice-Hall, $8.36.
**Soil Management for Conservation and Production, Cook, J.W. Wiley and Sons, 1962.
**Soil Physics, Kohnke, McGraw-Hill.
**Using Commercial Fertilizers, McVicker, Interstate, 1961, $4.00 Good.
**Our Natural Resources, McNall, Interstate, 1964.
**Soil Science Simplified, Kohnke & Helmut, Bolt, 1962. Good.
**Soil Conservation, Stallings, Prentice-Hall, 1957, $11.75.
*Experiments in Soil Science, California State Polytechnic College, San Luis Obispo, California 93401, $4.00.
**Factors of Soil Formation, Jenny.

Bulletins:

*"Soil Judging in Indiana" Purdue Mimeo I.D. 72.
*"Soil Color" Voc. Ag. Service, 434 Mumford Hall, Urbana, Illinois 61801
*"Soil Texture" - Illinois V.A.S.
**"Teaching Soil and Water Conservation, A Classroom and Field Guide" PA 341 U.S.D.A.
**"Water Intake by Soil Experiements for High School Students" Misc. Publ. No. 925, U.S.D.A.
**Soils Yearbook, U.S.D.A.
**Land Capability Classification, Agriculture Handbook No. 210, U.S.D.A.
**Soil Survey Manual, U.S.D.A."
*"Sampling the Soil", National Fertilizer Association, Washington, D.C.
*"Soil Testing" Purdue University Extension Circular, 488.
**"The Fertilizer Handbook:, National Plant Food Institute (NPFI) 1700 K. Street N.W., Washington, D.C. 20006

*Student Reference
**Instructor or Classroom reference

*"Our Land and Its Care", N. P. F. I.
*"What is Fertilizer?" N. P. F. I.
*"How to Take a Soil Sample", N. P. F. I. (Leaflets** and Poster*)
*"Lime Means More Money for You", N. P. F. I. (leaflets** and Poster*)
**"How Soil pH Affects Plant Food Availability", N. P. F. I. (Poster)
**"Hunger Signs in Crops", Illinois V. A. S., VAS 4011a
*"Soil and Plant Tissue Tests", Purdue Station Bulletin 635
*"Soil Science Simplified", Kohnke, Published by Author

Films:

"The Depth of Our Roots", New Holland, C-18 Min.
"Making the Most of a Miracle" (Plant Nutrition), N. P. F. I.
"The Big Test" (Importance of Soil Testing), N. P. F. I.
"What's in the Bag" (Fertilizer) N. P. F. I.

Film Bulletin:

"Films to Tell the Soil and Water Conservation Story" 1970 Soil Conservation Service, Film Library, Rm. 503-134 So. 12th St., Lincoln, Nebraska 68508.

Film Strips:

"Soil Color" Vo-Ag. Service, 434 Mumford Hall, Urbana, Illinois.
"Soil Structure" Vo-Ag. Service, Illinois.
"How and Why Soils Differ", Vo-Ag. Service, Illinois.

Slides:

"How to Take a Soil Sample", N. P. F. I.
"Soils, Plant Nutrition and Fertilizers", N. P. F. I.
"Deficiency Symptoms" (Choice by crop, 25¢ ea.) N. P. F. I. (Send for Catalog.)
"Soil Profile Slides", 16 slides, $6.00. (Send for Catalog.)

Periodicals:

"Plant Food Review", N. P. F. I. (Free to Schools.)

TEACHER'S CURRICULUM GUIDES FOR SOILS

"Understanding the Nature and Importance of Soil", AP-1, C. E. Richard, VPI & SU, Blacksburg.

"Preparing the Soil for Planting", AP-3, C. E. Richard, VPI & SU, Blacksburg.

"Developing a Soil and Water Conservation Plan", AP-4, C. E. Richard, VPI & SU, Blacksburg.

"Testing Soils", AP-8, C. E. Richard, VPI & SU, Blacksburg.

"Determining Land Capability Classes", AP-2, C. E. Richard, VPI & SU, Blacksburg.

Extension Division Bulletins, VPI & SU,
Blacksburg, Virginia 24061.

NO.	PUBLICATION
342	"No-tillage Corn - Current Virginia Recommendations"
429	"Soil Fertility Guides for the Piedmont"
97	"Agronomy Handbook"
136	"How Soil Reaction Affects the Supply of Plant Nutrients"
297	"Soil Fertility Guides - for the Coastal Plains Region of Virginia"
299	"Soil Fertility Guides - for the Appalachian Region of Virginia"
684	"Liming for Efficient Crop Production"
36	"Your Fertilizer Use and Crop Record"
106	"Lime Use Guides - for the Coastal Plains Region of Virginia"
107	"Lime Use Guides - for the Appalachian Region of Virginia"
108	"Lime Use Guides - for the Piedmont Region of Virginia"
405	"Lime for Acid Soils"
34	"Soil and Water Conservation Record Book"
CS48	"Soil Sterilization"
47	"Know Your Soils, Unit 2, Major Soil Differences"
23	"The Story of Land"
228	"Working Together for a Liveable Land"

USDA Bulletins (1 each of 100 publications, free)
Publications Division, Office of Information,
U.S.D.A., Washington, D.C. 20250. *FOR SALE ONLY

NO.	PUBLICATION	PRICE
AH210	Land Capability Classification. 1961	.15¢
AH18	Soil Survey Manual. 1951.	$3.50*
AB320	Know the Soil You Build On. 1967.	--
L539	Land Forming, A Means of Controlling Surface Water on Level Fields. 1967	.05*
L512	Mulch Tillage in the Southeast	--
YB1957	Soil (Yearbook)	$4.00*
L307	How Much Fertilizer Shall I Use? 1963.	--
G89	Selecting Fertilizers for Lawns and Gardens. 1971.	--
TITLE	Superphosphate: Its History, Chemistry, and Manufacture. 1964.	$3.25*

*"Maintaining Organic Matter in Soils" VAS, Illinois
*"Soil Structure" VAS, Illinois

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*Student Reference
**Instructor or Classroom Reference

TEACHING AIDS:

1. Samples of Soil separates, Purdue Agronomy Club
   Life Science Building
   Purdue University
   Lafayette, Indiana 47907

2. Soil Profiles
   Information and directions necessary to make soil profiles. (See following four pages)

3. Land Capability Maps - Local S.C.S. Office.

4. Soil Auger: Nasco, price range $4.79 - $13.50.

5. Tissue Test Kit V.A.S. $4.00/kit.

6. Transparencies.

7. Samples of soil structure.

INFORMATION AND DIRECTIONS NECESSARY TO MAKE SOIL PROFILES

When teachers of agriculture observe soil monoliths on display at fairs and agricultural meetings, they often wish for one or more in their own classroom. Few teachers of agriculture make maximum use of soil monoliths for instructional purposes because they do not have them and they are not readily available.

This section of the booklet is written to encourage teachers and students to make their own soil monoliths. Be advised, however, that while soil monoliths are relatively inexpensive, they do require considerable time to make.

The collection and preservation of soil profiles begin with an interesting field trip and often culminates in an excellent laboratory or science fair project for several of the students. Close supervision by the teacher is necessary to insure sucess.

The finished profile, stable in a vertical position, adds to the classroom decor when displayed on the wall. In class the soil monolith can be used to teach soil type, structure, horizons, and characteristics relative to the living phase of the profile. It is a useful instructional aid when teaching land judging, doing a television program, or preparing a student demonstration.

Mounted soil profiles are invaluable instructional aids for teaching. The idea is to make them now, use them when the occasions arise, and hang them on the classroom wall until they are needed again.

Materials Needed:

Tools and materials needed to prepare soil monoliths include shovels, flat spade, mattocks, knives, scissors, measuring tape, cloth, string, and several squeeze bottles with solutions premixed. Two one-inch boards, one 6" and the other 8" wide, will be needed to support the profile. The length of the boards, approximately 48", will depend upon the depth of the soil from which the profile is taken.

Solutions Needed:

Solution No. 1 is a diluted solution of cellulose acetate in acetone. It is made by dissolving 140 grams of cellulose acetate in acetone to make one gallon of solution.

Solution No. 2 is a concentrated solution of cellulose acetate in acetone. It is made by dissolving 450 grams of cellulose acetate in acetone to make one gallon of solution.

Solution No. 3 is a mixture of vinylite resin, acetone, and methyl isobutyl ketone. It is made by dissolving 240 grams of the vinylite resin into a 2:1 mixture of acetone and methyl isobutyl ketone to make one gallon of solution.

The solutions are made by preparing a slurring first and then adding additional solvent to the slurry. Prepared solutions can be stored for several days before they are used. Since they solidify when exposed to air, it is important that solutions be kept in closed containers.

Solutions should be applied to soil monoliths with plastic squeeze bottles rather than a spray gun. The gun often becomes clogged and is difficult to clean. Place solution No. 1 in a plastic bottle overnight to test the reaction of the solution on the plastic. THE ACETONE MAY DISSOLVE THE BOTTLE.

Sources of Solution Materials:

Acetone and methyl isobutyl ketone can be purchased at almost any chemical supply house. A source for each of the other two materials is as follows:

Vinylite NYHH resin
Bakelite Corporation
230 North Michigan Avenue
Chicago 1, Illinois

Cellulose acetate
Hercules Powder Company
Cellulose Products Department
Parlin, New Jersey

Site and Soil Conditions:

Factors to consider when selecting a site for preparing a soil profile are as follows:

1. Make sure that all of the horizons are intact if an exposed profile is found at an excavation.

2. Avoid taking profiles in wooded areas because tree roots will interfere with obtaining a good monolith.

3. Do not take a sample from extremely stony or sandy soil if inexperienced at the task. Profiles are difficult to obtain from stony or sandy soils.

4. Make sure the soil is moist before taking the profile sample. If drought persists, soak the site thoroughly with water several days before exposing the profile.

5. Dig the pit large enough and deep enough to expose the full profile. The pit should be at least 3' wide and 5' long. When the pit is dug the strenuous work is done and the more tedious work begins. Slope one of the 3' sides of the pit approximately 5 degrees and plane the surface as smooth as possible. The smoothed surface should be 18" to 24" wide. The center 6" of the smoothed side should be used for the soil profile sample.

Removing the Sample:

Lay the 6" board in the center of the smoothed surface of the prepared pit. Use a knife to mark the soil around the edge of the board. Remove the board and treat the marked area with approximately 1 quart of solution No. 1. Permit the treated area to dry 10 to 15 minutes (longer for heavier soils and cooler days) and treat it the second time with about 1 1/2 quarts of solution No. 2.

Approximately 30 minutes after solution No. 2 has been applied, place the 6" board firmly against the treated area. Trench out the soil 6" to 8" wide and 3" to 5" deep on each side of the board. Next, cut behind the entire length of the soil profile from one of the side trenches. Start from the other trench to cut holes through to the first trench at 6" intervals. Tie the profile securely to the board at each hole. Finally remove the remainder of the soil that is holding the profile to the pit, and carefully lift the profile from the excavation.

Finishing the Monolith:

Carefully transport the soil profile in a horizontal position to the school shop so that the remainder of the work can be done indoors. Place the board which is supporting the profile on a laboratory table in a well-lighted part of the shop.

Apply Solution No. 2 liberally in strips to the 8" board and place it alongside the 6" board which is supporting the profile. Gentlytransfer, by sliding, the soil profile from the 6" board to the 8" board. Center the profile on the board, allowing space at the top of the board for the soil type name. Now gently press the profile to the 8" board, remove the excess solution, and allow to dry for 24 hours.

After the profile is firmly cemented to the 8" board, it should be trimmed to the desired thickness (1" to 1 1/2"). Natural structure of the soil can be 'brought out' only with considerable patience and time. An ice pick is useful in 'bringing out' the soil structure. Blow the loose soil particles from the profile with air. Brushing will damage soil structure at this point.

When completely satisfied that the soil profile is "worked down" properly, saturate it with solution No. 3. Apply the solution from a squeeze bottle, allow it to soak in, and apply more solution. Do not apply this solution with a brush because it will result in a smearing of the surface and destroy the aggregate structure of the soil.

Adequate ventilation is needed at all times when using solutions indoors. Inhalation of fumes from the solutions may cause illness and headaches. Open flames and smoking should not be permitted because of the combustible nature of the solutions.

When solution No. 3 is fixed (2 to 3 days) the soil monolith can be framed with 3/4" x 3/4" quarter round moulding glued to the board. The board and moulding should then be sanded and finished with clear sander sealer, gloss lacquer, and varnish. Soil type, horizons, and other pertinent information should be painted neatly in black at the appropriate places on the board and moulding.

PREPARING FOR SOILS MODULE

Proper preparation, as in all things, is one of the best assurances of success. Therefore, it is imperative that prior planning be completed before teaching each lesson.

Plans should be made several weeks or months preceding the need for much of the material. Films should be booked as soon as possible to assure their arrival when needed. This will necessitate careful thought in the preparation of your teaching calendar for this module. An inventory of present equipment should yield information necessary to securing needed teaching aids, equipment, and replenishing supplies.

Many other teaching aids can be compiled on shorter notice. Handouts and overhead transparencies can be supplied on rather short notice in most schools. Adjustments will be necessary according to the instructor's and school's clerical assistance in this area.

Short range planning varies considerably with individual instructor's compentencies in the teaching area and with previous teaching experience. One may generalize, however, and conclude from good teaching methods, that films should be previewed; experiments and demonstrations "pre-run". Subject matter should be reviewed, and adapted and updated lesson plans will be of benefit for each lesson.

The author has attempted to exclude materials that were presumably taught in previous vo-ag. offerings. It will be necessary for each instructor to discern if a review of previous material is necessary. The author has attempted to provide several teaching techniques for each lesson. It is not assumed that all would be used within the time allotment, but that you may have as many alternatives as possible from which to select.

Soil Module Time Allotment
Allotted days: 15 (at 55 minutes period per day)

Lesson		Minutes
I:	What is soil?	110
II:	Physical Features of Soil	110
III:	Biological Features of Soil	110
IV:	Soil Water	165
V:	Chemical Features of Soil	220
VI:	Soil Erosion	110
	TOTAL (15-55 min. days)	825

Course: Advanced Crop and Soil Science

Module: Soils

Lesson I: What is Soil?

Suggested teaching time: 2 days
Suggested teaching procedure:

1. Relate to the students the objectives of studying this lesson.

2. Use the method of introducing the lesson or a comparable motivational step to build interest. One of the films or film strips may be useful for this purpose.

3. Make a written assignment similar to the problems or a study guide for the students.

4. Allow sufficient time for supervised study.

5. Discuss the assignment

   a) Show the transparency "What is Soil?" and establish a definition.
   b) Show the transparency "Soil Forming Process" and discuss the outline of the process. Also show the transparencies, "Rock Weathering", "Physical Weathering", and "Chemical Weathering" to bring the total concept into perspective.
   c) Show the transparency "Typical Mineral Soil Composition by Volume" to illustrate the average soil and that many factors are important within the soil.
   d) Show the transparencies "Factors Affecting Soil Formation", "Parent Material", "Climate", "Native Vegetation", "Topography", and "Age" to show how each affects how a soil is formed.
   e) Show the transparency "Soil Organic Matter", discuss how it is formed and its purpose in the soil complex.
   f) Show transparency "Definitions" to acquire an agreeable working vocabulary of soil terminology.
   g) Show transparency with overlays of "Typical Soil Profile" to reinforce what and where the profile and terminology apply.

6. Supplement transparencies with other teaching aids, such as films, film strips, and bulletins to enhance interest and learning.

7. Summarize and evaluate the lesson in terms of the lesson's objectives.

Objectives:

1. Students be able to define "soil".
2. Students be able to list the soil forming agencies.
3. Students be able to define and use soil terminology.
4. Students be able to discuss how the soil is formed and what makes up the soil complex.

Introduction:

One farmer may produce 45 bushel corn and another farmer 90 bushel corn, both without fertilization. Which farm would you prefer to buy? Why?

References:

Text: Selection from recommended, such as:
Our Soil and Their Management, Donahue.

Filmstrips: "How and Why Soils Differ", V. A. S. Illinois

Bulletins: "Soil Structure", V. A. S., Illinois
"Maintaining Organic Matter in Soils", V. A. S., Illinois

Problems:

1. What is soil?
2. How is a soil formed?
3. What is the composition of the average soil?
4. What factors affect soil formation?
5. How is soil organic matter (O. M.) formed?
6. What purpose does O. M. serve?
7. Define:
   a) Profile
   b) Horizon
   c) Solum
   d) Regolith
   e) Earth

f) Surface Soil
g) Subsoil
h) Parent Material
i) Topsoil
j) Leaching

Summary:

The formation of soil is a tedious and endless process. Man can play havoc with the soil; a mountain on its way to the sea, as it is often called. We must do our best to preserve the most valuable of our natural resources, the soil.

Evaluation:

A. Did the students grasp the concept of the tediousness of soil formation?

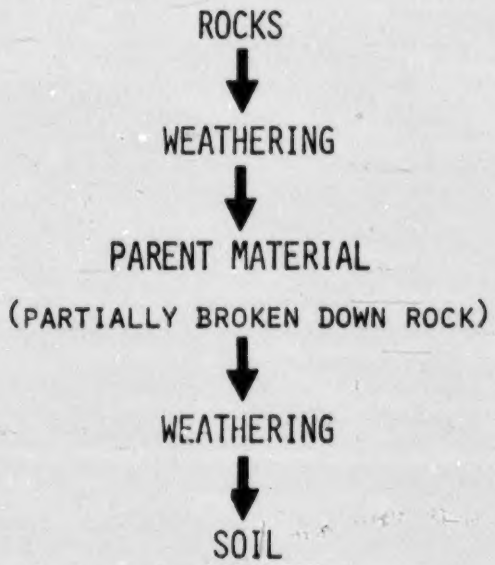
B. Did they understand how soils are formed and the role of organic matter in the soil?

C. Are students able to use the basic terminology of soils? Student Evaluation:

WHAT IS SOIL?

SOIL IS THE MINERAL AND ORGANIC MATERIAL THAT SUPPORTS PLANT GROWTH ON THE EARTH'S SURFACE. IT IS A MIXTURE OF PARTICLES OF ROCK, ORGANIC MATERIAL, AIR AND WATER.

SOIL FORMING PROCESS



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THE FUNCTIONS OF SOIL

1. MEDIA FOR THE SUPPORT OF PLANTS

2. SUPPLIES: PLANT FOOD-NUTRIENTS

3. PROVIDES MOISTURE TO PLANTS

4. MEDIA FOR SEED GERMINATION

T

Rock Weathering

The process by which rocks are broken down into soil size particles through exposure to the weather over hundreds and thousands of years.

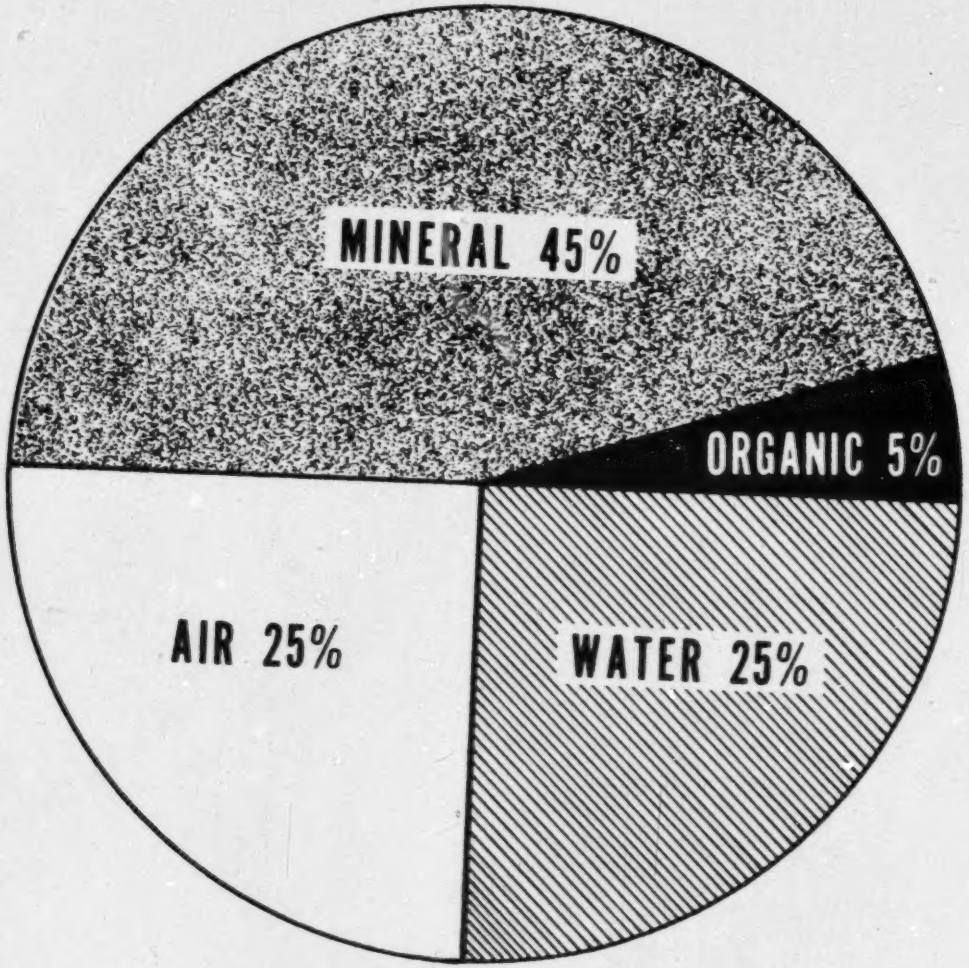
PHYSICAL WEATHERING

1. TEMPERATURE CHANGES
2. RAPIDITY OF TEMPERATURE CHANGE
3. EXFOLIATION - PEALING-AWAY OF SURFACE
4. WIND
5. PLANTS AND ANIMALS
6. WETTING AND DRYING

CHEMICAL WEATHERING

1. HYDROLYSIS
2. HYDRATION
3. SOLUTION
4. OXIDATION
5. REDUCTION
6. CARBONATION

TYPICAL MINERAL SOIL COMPOSITION BY VOLUME



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FACTORS AFFECTING SOIL FORMATION

1. PARENT MATERIAL
2. CLIMATE
3. NATIVE VEGETATION
4. TOPOGRAPHY
5. AGE

PARENT MATERIAL

PRODUCT OF ROCK WEATHERING

SEDENTARY - RESIDUAL (REMAINED IN PLACE)

1. IGNEOUS - FORMED FROM SOLIDIFYING OF MOLTEN MATERIALS AS FROM A VOLCANO
2. SEDIMENTARY - ROCK DEPOSITED BY RIVERS, MOVING GLACIER, OCEANS OR WIND.
3. METAMORHIC - IGNEOUS OR SEDIMENTARY ROCKS REFORMED DUE TO TREMENDOUS TEMPERATURE AND PRESSURE.

TRANSPORTED - MOVED

1. ALLUVIAL - BY STREAMS
2. COLLUVIAL - BY GRAVITY
3. MARINE - BY OCEANS
4. LACUSTRIAN - BY LAKES
5. GLACIAL DRIFT - BY GLACIERS
6. LOESS (AOELIAN) - BY WIND

CUMULOSE - PEAT OR MULCH SOILS

(FORMED BY HIGH WATER TABLE)

T

CLIMATE

ONE OF MOST IMPORTANT AFFECTS

1. TYPE OF VEGETATION
2. RATE OF ORGANIC MATTER AND MINERAL BREAKDOWN
3. LEACHING
4. FREEZING AND THAWING
5. EROSION BY WIND AND WATER

RELATIONSHIP OF TEMERATURE AND MOISTURE

TEMPERATURE:	HOT
	TEMPERATURE
	COLD
MOISTURE:	HUMID
	SUBHUMID
	SEMIARID
	ARID

T

NATIVE VEGETATION

TYPES:

TIMBER OR PRAIRIE

TOPOGRAPHY

LENGTH, DEGREE, AND REGULARITY OF SLOPE

CLASSIFIED AS:

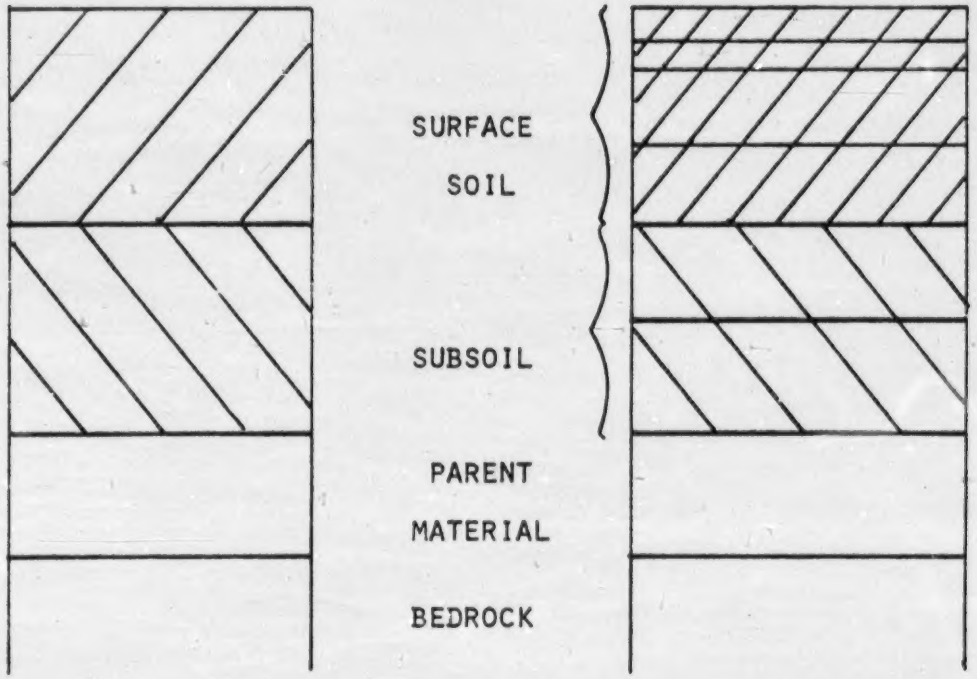
FLAT
LEVEL
UNDULATING
GENTLY ROLLING
ROLLING
HILLY
ROUGH OR BROKEN

AGE

AFFECTED BY:

1. TIME
2. AMOUNT OF WEATHERING

YOUNG AND OLD SOIL



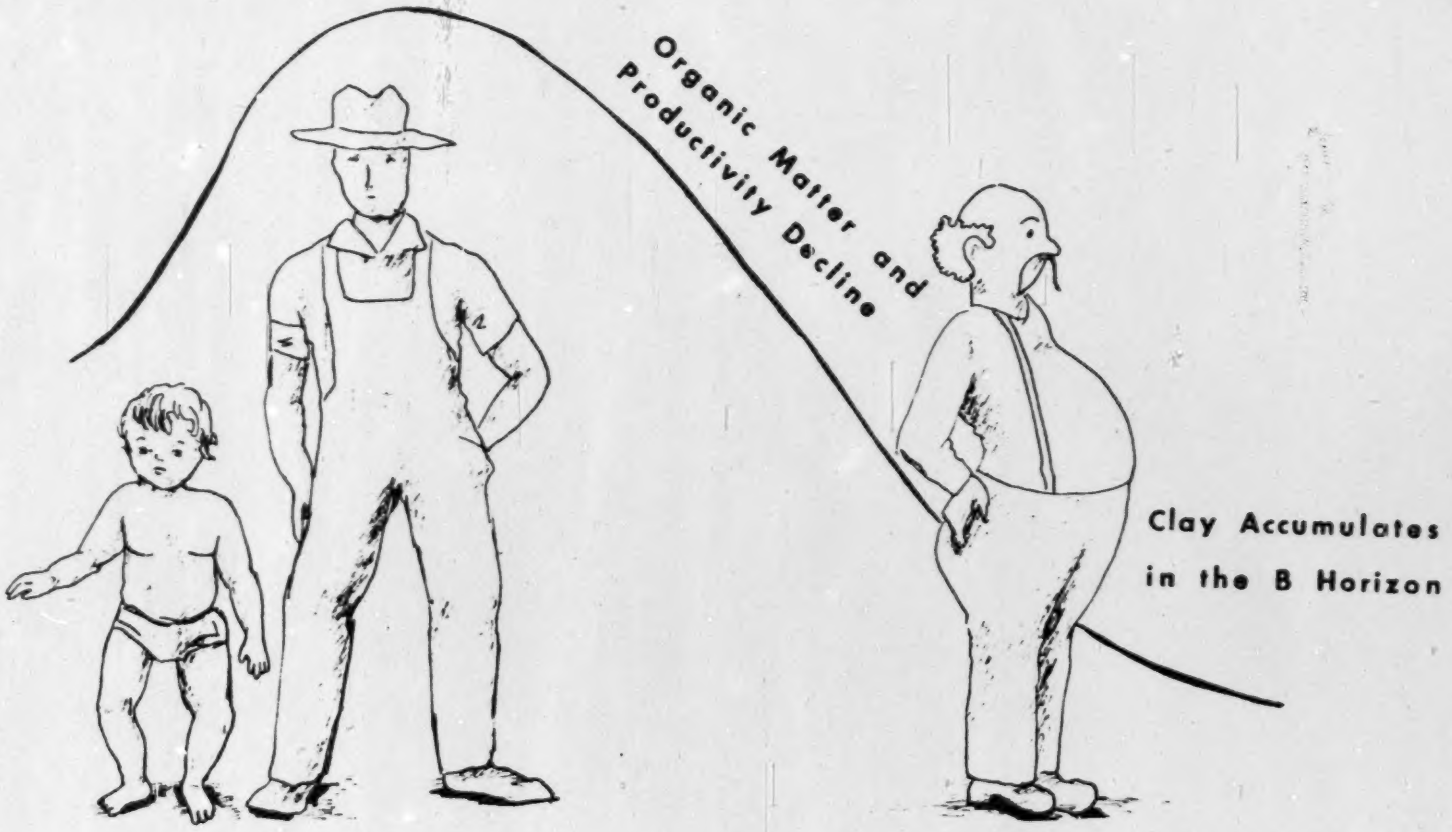
YOUNG

HORIZONS BLENDED

OLD

SHARPLY DEFINED HORIZONS

SOILS AGE WITH TIME



Organic Matter Accumulates

Productivity Builds Up

SOILS AGE WITH TIME

Time

Weathering causes soils to develop, mature, and age much as people do. Soils, like people, develop quickly in their youth. Weathering quickly releases plant nutrients from the soil minerals; plants grow more vigorously as the plant-food supply in the soil increases; and organic matter accumulates. Decomposition of the organic matter results in the formation of carbonic and other soil acids which speed up the weathering process. Water, percolating through the soil, begins washing some of the clay particles down into lower regions within the soil and the development of the subsoil begins. With time, a mature soil is developed which is at the peak of its productivity.

Soils then slowly age as they continue to weather. Water moving through the soil continues to leach away the more soluble portions with time. Eventually, the supply of nutrients made available to plants each year is reduced. Most soils become acid because the limestone originally in them has been dissolved and leached away. As the supply of plant nutrients in the soil decreases, plants grow less vigorously and the annual addition of organic residues to the soil decreases. The humus supply in the soil then begins to drop. Old prairie soils (called Planosols) have grayer colored surface horizons than the younger prairie soils.

In permeable soils the fine clay particles wash downward from the surface horizons into the subsoil during the weathering process. This movement, together with further breakdown of the soil minerals causes large amounts of clay to accumulate in the subsoil and results in the formation of claypans in the older soils.

As soils go through the more advanced stages of weathering they slowly decline to lower and lower levels of productivity. They need careful management to increase the supplies of plant food and improve their permeability. These soil changes, of course, involve long periods of time. Do you live on young, mature, or old soils?

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SOIL ORGANIC MATTER

PARTIALLY DECOMPOSED PLANT AND ANIMAL RESIDUES.

ORGANIC MATERIAL - CAN STILL RECOGNIZE WHAT IT ORIGINALLY WAS

ACTIVE ORGANIC MATTER - SUFFICIENTLY DECOMPOSED TO BE CHEMICALLY ACTIVE

FUNCTION:

1. CHIEF CAUSE OF FRIABLE SOIL
2. SUPPLIES NUTRIENTS (N,P,S, AND B)
3. RETAINS MOISTURE
4. FEED SOIL ORGANISMS
5. HOLDS NUTRIENTS (Ca,Mg,K,NH_4, ETC)

DEFINITIONS

A) PROFILE - CROSS-SECTION OF SOIL WITH DEPTH

B) HORIZON - HORIZONTAL LAYERS OF SOIL

C) SOLUM - HORIZONS ABOVE PARENT MATERIAL

D) REGOLITH - ALL UNCONSOLIDATED MATERIAL ABOVE THE BEDROCK

E) EARTH - GENERALLY CONSIDERED TO BE REGOLITH

F) SURFACE SOIL - MAJOR ZONE OF ORGANIC MATTER ACCUMULATION

G) ELUVIAL ZONE - SURFACE SOIL, AREA FROM WHICH THINGS ARE LEACHED

H) SUBSOIL - RECEPTICAL FOR LEACHED MATERIAL

I) ILLUVIAL ZONE - SUBSOIL, ZONE INTO WHICH THINGS ARE LEACHED

J) PARENT MATERIAL - THE MATERIAL FROM WHICH SOIL IS FORMED

K) TOPSOIL - GENERALLY CONSIDERED AS PLOW LAYER

L) LEACHING - REMOVAL OF ORGANIC MATTER, NUTRIENTS, AND MINERAL MATTER BY WATER

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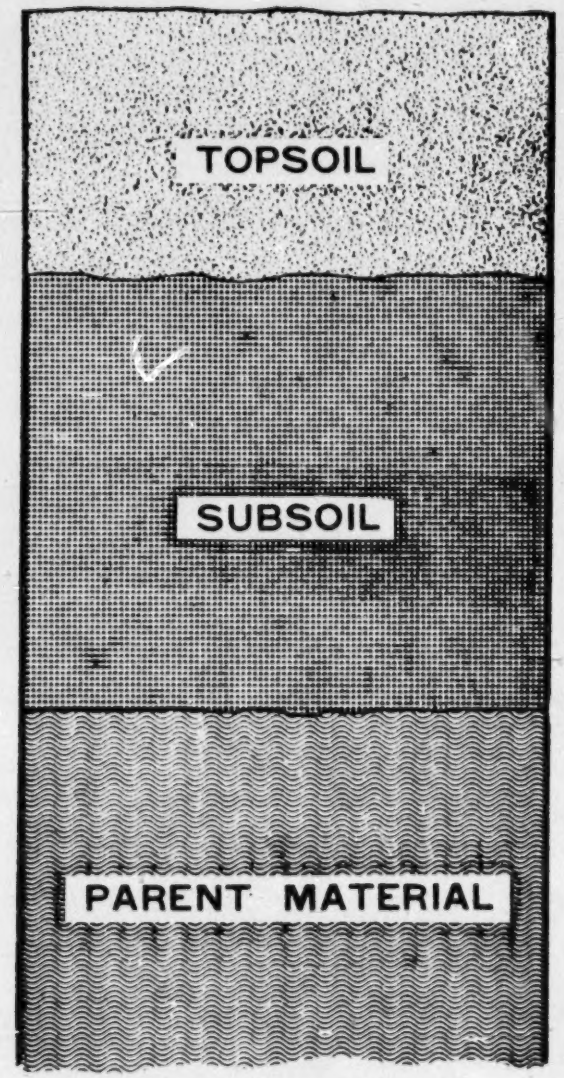
LAYERS IN A SOIL PROFILE



A HORIZON

B HORIZON

C HORIZON

LAYERS IN A SOIL PROFILE

Soils are composed of one or more layers or horizons lying approximately parallel to the earth's surface. The different horizons developed from the interaction of the different soil-forming factors. A vertical section through the horizons is called a soil profile. They differ in one or more properties, such as color, texture, structure, consistency, porosity, and reaction.

Soil horizons vary in thickness and generally are merged with one another; therefore, the horizons usually lack sharp boundaries. Most soils have three principal horizons, which are designated by capital letters: the surface on "A" horizon, the subsoil or "B" horizon, and the substratum underlying the subsoil, or "C" horizon.

The combined A and B horizons, the major part of a profile, are called the solum or true soil. This is the area that supports plant growth. In the scientific study of soils, differences within each horizon are subdivided and identified by the proper letter plus a subscript number. For example, the A horizon might be subdivided into a surface (A_1), which is dark in color as a result of accumulation of organic matter, and a subsurface (A_2) horizon which is lighter in color, lower in organic matter, and strongly leached. A third subdivision (A_3) is often recognized in soils not having an A_2 horizon. These subdivisions provide clues to the processes of soil formation and are important in the use and management of soils.

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HORIZON CHARACTERISTICS

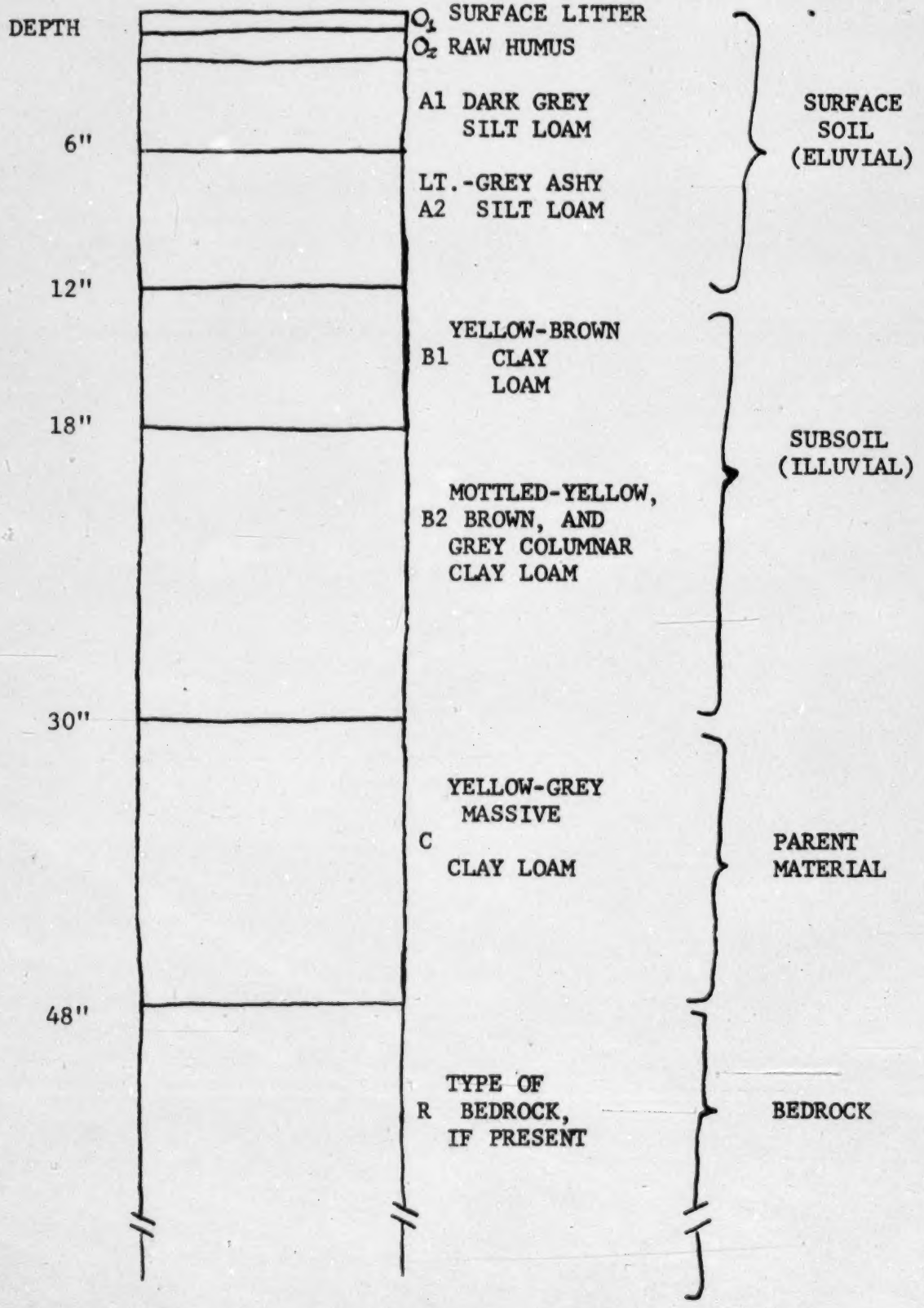
1. "A" HORIZON
   A. MAY BE A FEW INCHES TO A FOOT OR MORE DEEP
   B. USUALLY DARK COLORED
   C. LIGHTER IN TEXTURE THAN B OR C HORIZONS
   D. MORE LIKELY TO HAVE GRANULAR STRUCTURE THAN THE OTHER HORIZONS

2. "B" HORIZON
   A. USUALLY LOW IN ORGANIC MATTER
   B. USUALLY RED OR YELLOWISH IN COLOR
   C. STRUCTURE IS LESS DESIRABLE THAN THE "A" HORIZON.
   D. IT MAY HAVE A BLOCKY OR PRISMATIC STRUCTURE.

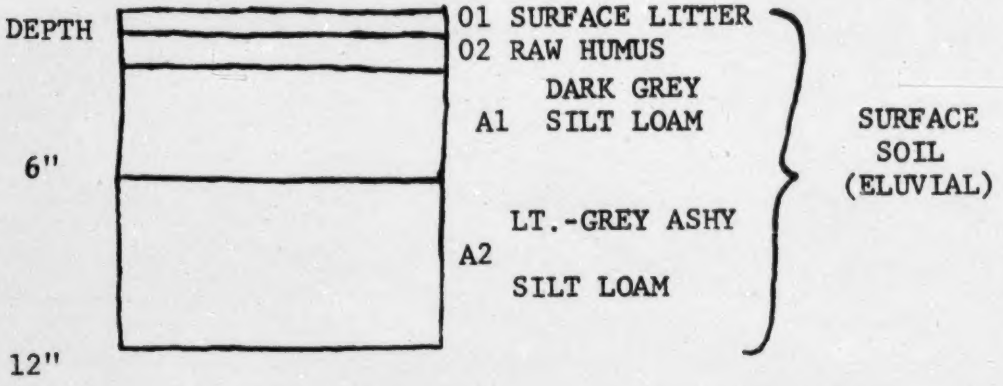
3. "C" HORIZON
   A. IT IS USUALLY THE DEEPEST OF THE THREE MAJOR HORIZONS.
   B. USUALLY VERY LOW IN ORGANIC MATTER
   C. THE TEXTURE IS OFTEN COURSE.
   D. STRUCTURE USUALLY UNDESIRABLE.
   E. IT IS COMMONLY LIGHTER IN COLOR THAN THE A AND B HORIZON.

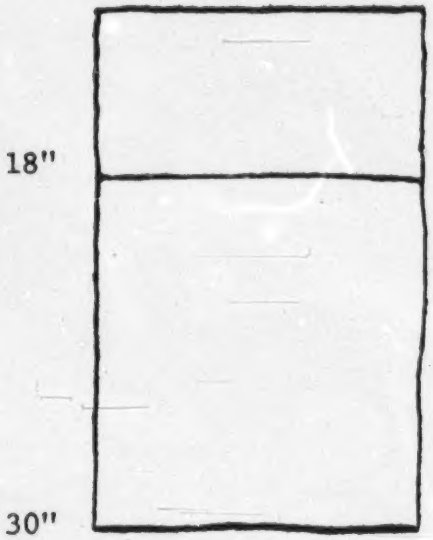
H

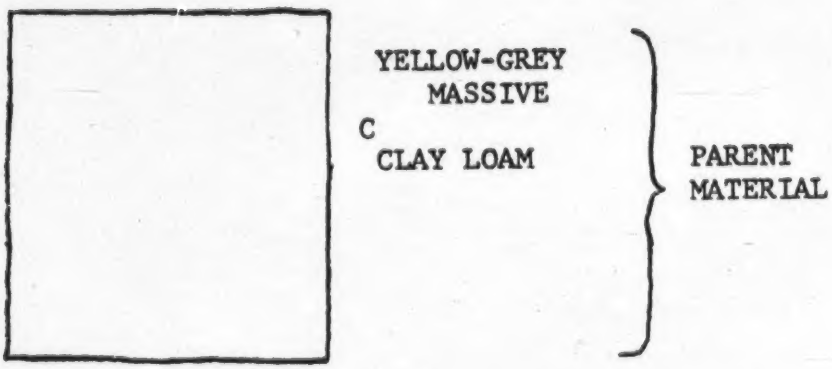
TYPICAL SOIL PROFILE

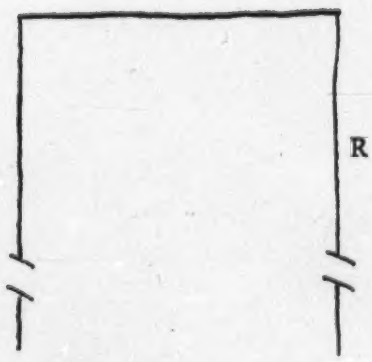


TYPICAL SOIL PROFILE




18"
30"
YELLOW-BROWN
B1 CLAY
LOAM
MOTTLED-YELLOW
B2 BROWN, AND
GREY
COLUMNAR
CLAY LOAM
SUBSOIL
(ILLUVIAL)


YELLOW-GREY
MASSIVE
C
CLAY LOAM
PARENT
MATERIAL
42"



TYPE OF
BEDROCK,

IF PRESENT

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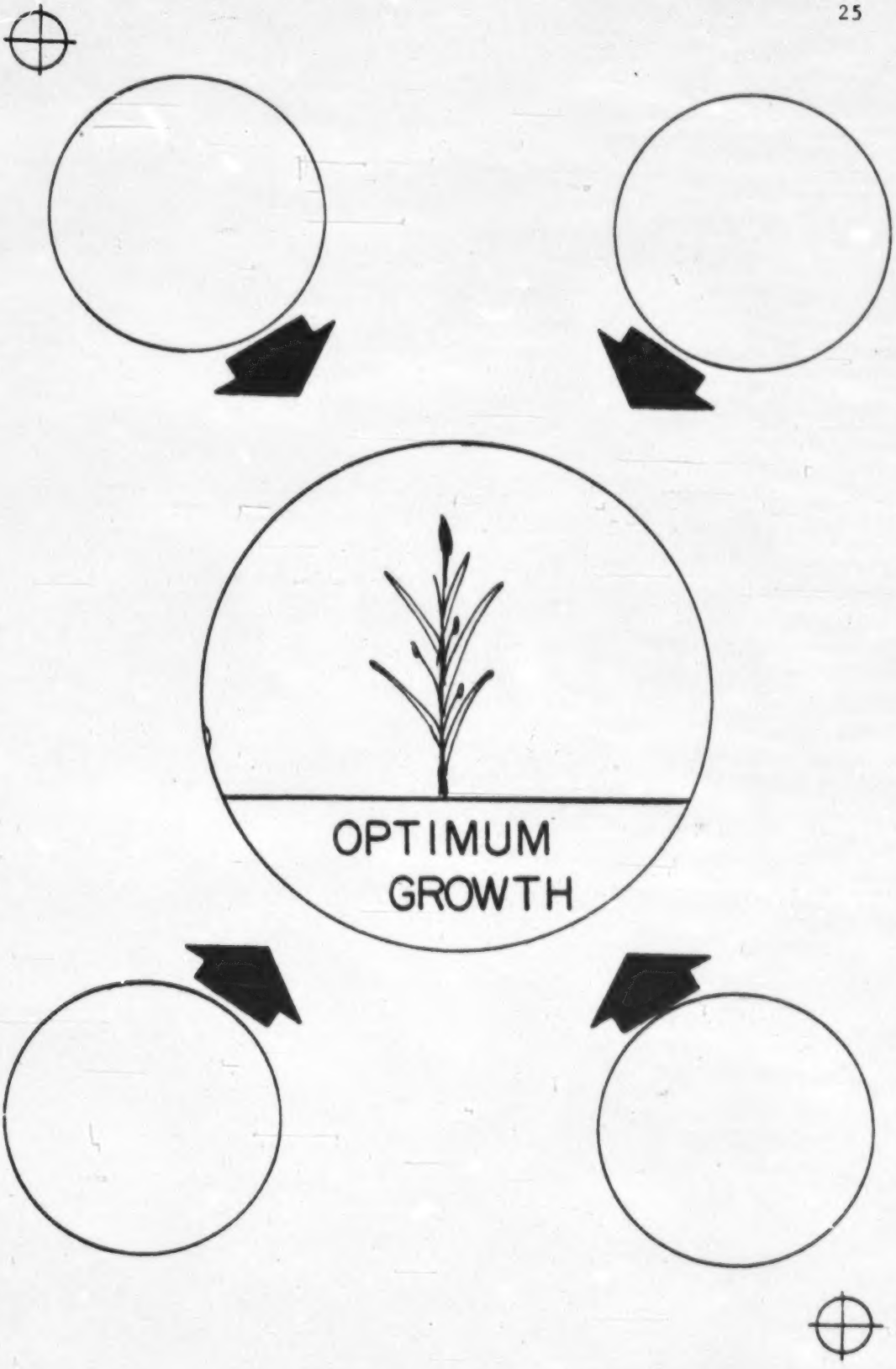

OPTIMUM
LIGHT

OPTIMUM
HEAT

OPTIMUM
WATER

OPTIMUM
NUTRIENTS